2004

Progress in Radiology 2004

Proceeding Papers

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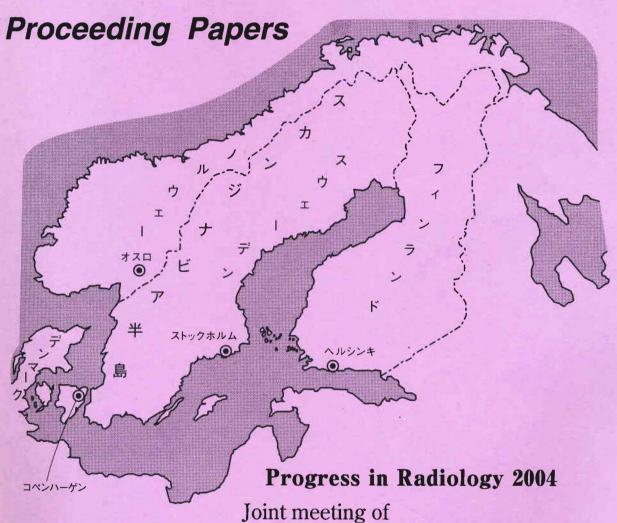## Progress in Radiology 2004

Joint meeting of
5th Symposium of Scandinavia Japan
  Radiological Society ,
8th Nordic Japan PACS Symposium,
15th Symposium of Kinemato-Dynamic
Digital Imaging in Medicine, and
12th Symposium of Japanese society of
MRA

Yamagata, September 23-25, 2004

Sep 24 (Fri.)

Session 1. **9:00-10:00**
PACS 1 **Moderators: H.U. Lemke and H. Nishitani**

1: Management of Electronically Requests and Answers in a Radiology Department using Speech Recognition Reporting
>   Finn K. Mathiesen
>   Department of Radiology, Vejle County Hospital, Denmark

2: Recent advance in Medical information system of Hokkaido University Hospital
>   Toshikazu Nambu, Kazuo Miyasaka, Yoshikaru Watanabe
>   Department of Radiology,Hokkaido University Hospital, Hokkaido, Japan

3: New Enterprise Image Management System in Gifu University Hospital
>   Yasutomi Kinosada, Takao Umemoto
>   Department of Biomedical Informatics, Gifu University Hospital, Gifu, Jpan

4: Regulations for digital distribution for a completely filmless hospital
>   Kota Sakurai, Hiroki Takenaka, Tamio Kushihashi, Ryutarou Ukisu, Hidefumi Fujisawa,
>   Minako Suzuki, Tamaki Ichikawa, Kenji Hasezawa, Masaru Furune, Takashi Shibuya
>   Department of Radiology, Showa University Northern Yokohama Hospital, Kanagawa, Japan

5: canceled

6: Teleradiology in Western Norway
>   Aslak Aslaksen[1], Sverre A. Størkson[2]
>   [1]Bergen Hospital trust, Haukeland University hospital, Bergen, Norway
>   [2]Fonna Hospital trust, Haugesund, Norway

Session 2. **10:00-10:50**
PACS 2 **Moderators: S. Rafaelsen and Y. Kinosada**

7: The Current Status of Telepathology in Japan
>   Ikuo Tofukuji[1], Sumio Murase[2]
>   [1]Takasaki University of Health and Welfare, Gunma, Japan
>   [2]Department of Radiology, Shinshu University, Nagano, Japan

8: European Commission R&D activities and deployment initatives in the area of Information Technology in Health
>   Silas Olsson
>   ICT for Health Unit Information Society Directorate-General, European Commission, Brussels, Belgium

9: canceled

10: An integrated internet based web application for exchange of high volume images and messages between hospitals

      Ilangko Balasingham

      Interventional Center, Rikshospitalet University Hospital, Oslo, Norway

11: Present Situation of PACS in the world

      Kiyonari Inamura

      Kansai University of International Studies, Hyogo, Japan

Coffee break   **10:50-11:00**

Special lecture 1   **11:00-11:20**

               Moderators: S. Olsson and T. Okabe

Enterprise-wide Image Management and Grid Computing

Seong K. Mun

Radiology, Georgetown University Medical Center Washington, DC

Session 3.   **11:20-12:10**

Chest   **Moderators: A. Malinen and Y. Nakajima**

12: The pericardial fat mimicking the cardiac tumor; assessment with CT and MR Imaging

      Munemasa Okada, Katsuyoshi Ito, Shuichi Yamauchi, Naofumi Matsunaga

      Department of Radiology, Yamaguchi University School of Medicine, Yamaguchi, Japan

13: Peripheral lung cancer: Screening and detection with low dose spiral CT –TOSHIMA trial–

      Hiroyuki Tajima[1], Tatsuo Kumazaki[1], Satoru Murata[1], Kazuo Ichikawa[1], Ken Nakazawa[1], Tsuyoshi Fukunaga[1], Shiro Onozawa[1], Jyun Watari[1], Ryo Takagi[1], Madoka Nakahara[1], Jyunro Hosaka[1], Kanae Yamamoto[2], Yuuji Shinji[2], Hakuei Fukasawa[2]

      [1]Department of Radiology/Center for Advanced Medical Technology, Nippon Medical School, Tokyo, Japan

      [2]Toshima Medical Centre, Tokyo, Japan

14: Long-term findings of Farmer's lung disease in HRCT: Follow-up of low attenuation areas in inspiratory and expiratory HRCT

      Auli Malinen, R. Erkinjuntti-Pekkanen, K. Partanen, H. Rytken, R. Vanninen

      Department of Radiology, Kuopio University Hospital, Kuopio, Finland

15: Regulation of Regional Lung Perfusion by Nitric Oxide

      Sven Nyrén, D. Rimeika, N. P. Wiklund, L. R. Koskela, A. Torring, L. E. Gustafsson, S. A. Larsson, H. Jacobsson, S. G. Lindahl, C. U. Wiklund

      Department of Radiology, Karolinska University Hospital, Stockholm, Sweden

1: Management of Electronically Requests and Answers in a Radiology Department using Speech Recognition Reporting

Finn K. Mathiesen

Department of Radiology, Vejle County Hospital, Denmark

Background: The Nordic countries all have central personal registration numbers (CPR) for all citizens, the numbers are kept throughout life and composed of day, month and year of birth plus a 4 or 5 digit number. Healthcare is public and free and family doctors are paid by national health insurance. In this way all medical contact are registered for all citizens throughout life. Contacts between hospitals, clinics and e.g. radiology departments are based on the CPR numbers. In Denmark all practitioners must have electronically patient records (EPR).

Technology: A national board for healthcare communication (MEDCOM) has developed a standard form for request and answering, the first version is based on the Edifact standard. All practitioners in Vejle County use this standard and so do 60 percent of the clinical departments in the 6 County Hospitals. Edifact communication is send on a closed national healthcare network between EPR and radiology information system (RIS) and vise versa.

Speech recognition in Danish have been developed in our department based on the Philips SpeechMagic system and integrated into the Kodak RIS system. After dictation the reports are electronically signed by the radiologist in the RIS and automatically send to the requesting doctor by Edifact.

Results: Intensive use of electronically communication and limiting the number of steps in an examination to 5 (visitation, booking, reception, examination and reporting) have enabled us to deliver 95% of radiology reports within the same day as the examination. In-house patients have the results in their EPR before they have physically returned to their wards.

2: Recent advance in Medical information system of Hokkaido University Hospital

Toshikazu Nambu, Kazuo Miyasaka, Yoshikaru Watanabe

Department of Radiology,Hokkaido University Hospital, Hokkaido, Japan

Historical PACS system of Hokkaido University Hospital which originally started in 1989 has progressed and expanded with various ideas and contrivance. From March 2003, new version of medical information system has been released, in which many service including forms of the bylaws and informed consent, ordering of total prescription and examination , on-line PACS, computerized nursing support system(CNSS), speech recognition input are organized and utilized.

Medical conference support is provided by PC online terminals and media output. On line comment system are also used which is to be grown up to be electric medical records. And filmless system has been also started in 2004.

Merits, some keys and problems in the progressing medical information systems (efficiency of medical orders and procedures, data access speed, providing HIS/RIS/PACS terminals, cope with system troubles etc.) will be reported and discussed.

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3: New Enterprise Image Management System in Gifu University Hospital

Yasutomi Kinosada, Takao Umemoto

Department of Biomedical Informatics, Gifu University Hospital, Gifu, Jpan

Gifu University opened a new hospital on June 1st, 2004. The major feature is to be an electronic patient record (EPR) system-based paper-less/ film-less intelligent hospital. Every kind of patient records such as text, image, wave, movie and other types of data are centralized into the enterprise database system, which is managed and controlled under the EPR system. Another major feature is the optical fiber-based enterprise network system in a hospital. The topology of the network system is a star type. The backbone network system is 10Gbps in speed. There are more than 2500 EPR terminals and modalities in a hospital. Each of them is connected directly with a hospital network system via a 1Gbps optical-fiber one by one.

In a daily clinical routine, some sub-systems such as PACS in department of radiology are scheduled to send all data to the central EPR database after the examinations, even if they are more than 2,000 images in case of MDCT or in case of cinematic angiographic images. From the viewpoint of an EPR terminal, it is very easy for medical doctors, nurses and other co-medical staffs, to handle every type of patient records in a single uniform way for viewing, making reports or medical documents, and giving an explanation to patients. This means that radiographic images are not special data but very similar to other medical data such as texts and ECG waves, though the capacities are different among them. In case of our new hospital, we use the high-speed optical fiber-based network system, which allow us to retrieve, view and read lots of radiographic images from the central EPR database system on an ordinal EPR terminal in a short period of time.

An enterprise optical fiber-based high speed network system, which can make a replacement the conventional people-intensive work to laborsaving way in a hospital, is very effective and probably essential to speed up the data-exchanging. In a hospital, the film-less environment is completely achieved. Every EPR terminal can get all kind of radiographic DICOM data including cinematic images in a few second under the condition of no image compression. There is no complains about the enterprise optical fiber-based network system and the speed. The money for radiographic films is going to be cut to zero. The number of light box is reduced to nearly zero.

4: Regulations for digital distribution for a completely filmless hospital

Kota Sakurai, Hiroki Takenaka, Tamio Kushihashi, Ryutarou Ukisu, Hidefumi Fujisawa,

Minako Suzuki, Tamaki Ichikawa, Kenji Hasezawa, Masaru Furune, Takashi Shibuya

Department of Radiology, Showa University Northern Yokohama Hospital, Kanagawa, Japan

(Background) With the advancement of information technology in hospitals, the distribution of kinemato-dynamic digital imaging in medicine through hospital-wide network is gradually becoming realistic. However, like usual images, kinemato-dynamic digital images also need to satisfy the "Regulations for the electronic storage of clinical charts and other clinical records," in order for them to be used in actual medical examination. In other words, the images used for medical examination must be stored as the original images. The system in operation at our institute and our achievements are reported here together with some discussion.

(Method) All kinemato-dynamic digital images are stored in the imaging database in compliance with the DICOM. The images can be easily displayed with a viewer satisfying the designated standard. The imaging data are impossible to modify, and the digital imaging of which authenticity is ensured can always be monitored. As an example of our achievement, we determined the frequency of use of kinemato-dynamic digital imaging for each modality in fiscal 2003.

(Results) The number of tests conducted by kinemato-dynamic digital imaging was as follows: 1021 cases of cardiac angiography, 124 cases of virtual colonoscopy, 40 cases of virtual bronchoscopy, and 115 cases of 3-D images of myocardial quantitative gated SPECT.

(Conclusion) There is now a great need for imaging diagnosis using kinemato-dynamic digital imaging. Operational management regulations satisfying the "Regulations for the electronic storage of clinical charts and other clinical records" need to be established under all self-responsibilities at each medical facility.

6: Teleradiology in Western Norway

Aslak Aslaksen[1], Sverre A. Størkson[2]

[1]Bergen Hospital trust, Haukeland University Hospital, Bergen, Norway

[2]Fonna Hospital trust, Haugesund, Norway

The community hospitals in Norway are owned and run by the state and organized into 5 health regions. One of the regions, the western health region, comprising 0.9 mill people, is divided into 4 hospital trusts. All the radiological departments are fully digitized with RIS/PACS systems. The four trusts, unfortunately, have chosen RIS/PACS systems from different vendors and even different vendors within the same trust. Thus communication of radiological examinations within and between hospitals has been complicated and time consuming.

A project was therefore launched by the head of the radiological departments and head of IT-departments of the four trusts. The project was sponsored by the Norwegian directorate of health and the Norwegian research council. **The main objective of the project was to achieve a seamless and efficient workflow between hospitals and trusts with different RIS/PACS systems. The teleradiological solution in the western health region will be based on national and international standards, and will involve several RIS/PACS vendors.**

Technical objectives

- Implementing a teleradiological solution partly based on EDI and web-access for access to radiological information, initially on a regional level, then also between health regions. (radiological images, requests and reports)
- Establishing a regional database. The database may contain information about the patient, type of service, data and time of service, involved service provider, status of service and possibly some other information elements.
- The regional web server should allow any authorized web client access to the regional database.
- The web server should be able to transfer information from the original service provider via a message broker to local RIS/PACS.

Functional objectives

- Supporting both radiological and clinical demand for radiological information.
- Supporting both centralised and decentralised radiological reporting independent of radiological system/vendor.

Potential benefits

A functional teleradiological solution, providing fast and easy access to relevant radiological images and related request/report is a prerequisite for:

- Supporting the right of patients` free choice of hospital for treatment.
- Improving the communication between private and public radiology service providers.
- Optimizing the cooperation within and between health regions.
- Easier and cheaper access to radiological expertise when needed.
- Better and easier access to radiological information.

The paper will present the project and the results achieved.

7: The Current Status of Telepathology in Japan

Ikuo Tofukuji[1], Sumio Murase[2]

[1]Takasaki University of Health and Welfare, Gunma, Japan

[2]Department of Radiology, Shinshu University, Nagano, Japan

Background: Telepathology is the pathology practice at a distance using video imaging and telecommunications. The world's first telepathology was carried out successfully in 1983 between Keio University Hospital in Tokyo and Ise-Keio Hospital in Mie. As some useful telepathology systems were developed and appeared in the market in 1990s, pathologists and engineers have been challenging to utilize telepathology. Their efforts made the Ministry of Health, Labor and Welfare (MHLW) approve the application of the medical insurance for the intra-operative quick diagnosis telepathology in April 2000. Now telepathology has gotten a very important position in the telemedicine. Although there is no good statistical data on telepathology, so we could not know the actual conditions of telepathology.

Purpose: A investigation was planned to know the state of telepathology in practical medicine.

Method: A four pages of questionnaire sheets were mailed to the telepathology user hospitals, the responses were collected by fax. The investigation was done as a subject of the telemedicine research project under the 2003 MHLW scientific research program.

Result: The investigation was done in January 2004. 141 hospitals received the questionnaire sheets, 76 hospitals responded effectively; 44 hospitals of 76 were request site, 25 were diagnosis site, the rest did not telepathology any more. The average number of beds was 297 for a request site, 667 for a diagnosis site; the average number of fulltime pathologists in the user hospital was 0.16 for request site, 4.6 for diagnosis site. The total number of telepathology cases in 2002 was 3135, it keeps increasing from 1992, 75% of them were done for an intra-operative quick diagnosis. 50% of request site hospitals claim the insurance payment for the telepathology quick diagnosis. Many telepathology hospitals thought highly of good effects for the improvement of patient QOL, the quality of medical treatment and the level of local medicine.

Consideration: The lack and uneven distribution of full time pathologists promoted the spread of telepathology. The amount of the telepathology cases of Japan was estimated over 5000 in a year, now telepathology was already established an indispensable role in the clinical medicine. Hereafter we should work to construct a sustainable social and economical system with telepathology.

8: European Commission R&D activities and deployment initatives in the area of Information Technology in Health

Silas Olsson

ICT for Health Unit Information Society Directorate-General, European Commission, Brussels, Belgium

European Commission has since 1988 been active in the field of Information and Communication Technologies, ICT, for health, through its Research and Development programme. During the 15 years span of the programme, about 500 million Euro have been spent on approximately 400 R&D projects, best practice or accompany measures and studies that covered technical, clinical, ethical, legal, organisational and market issues of Health Telematics, which later become eHealth.

The new ongoing Sixth Framework R&D programme 2002-2006 has had so far one call (2003) for proposals regarding Health Telematics, or eHealth, as fully introduced as an umbrella term in this new programme. As a result of this call, some 20 projects with a budget of about 85 million Euro in EU contribution have recently been funded. The overall objective of the eHealth programme 2002-2006 is to develop an intelligent environment that enables ubiquitous management of citizens health status and to assist health professionals in coping with some major challenges, risk management and the integration into clinical practice of advances in health knowledge. There are three focuses on the foreseen research work:

Integration of biosensors and secure communications into wearable or implantable systems that provide citizens and their health professionals with ubiquitous management of health status.

Reliable software tools to support health professionals in taking promptly the best possible solution for prevention, diagnosis and treatment.

Networking of researchers in the area of medical informatics, bioinformatics and neuroinformatics with the objectives to advancing health knowledge leading to a new generation of eHealth systems assisting in the individualisation of disease prevention, diagnoses and treatment.

To support EU Member States, associated and candidate countries, in deployment of eHealth in their health systems two High-Level (minister level participation) European eHealth Conferences were launched in Brussels in May 22-23, 2003, and in Cork, Ireland in May 5-6, 2004. An important part of the conferences was the exhibition where real life eHealth applications were on show. Before the conferences these showcases succeeded in a competition and during the conferences the eEurope Awards for eHealth were given to the best applications/exhibitors in each of the following areas:

National and Regional eHealth Networks (2003)

eHealth Systems and Services for Health Professionals (2003)

Telemedicine and home care eHealth Applications (2003)

Empowering Citizens in Management of Health and Well Being (2003)

eHealth Information Tools and Services for Citizens (2004)

eHealth Administrative Support Tools and Services for Citizens (2004)

eHealth Homecare and Telemedicine Tools and Services for Citizens (2004)

To further support deployment of eHealth, European Commission has recently launched the strategy "An Action Plan for a European eHealth Area", adopted politically June 2, 2004, by the EU Council.

10: An integrated internet based web application for exchange of high volume images and messages between hospitals

Ilangko Balasingham

Interventional Center, Rikshospitalet University Hospital, Oslo, Norway

Hospitals in Norway are organized into five different health regions. The tendency within health regions is to utilize the resources in an effective manner by increasingly identifying hospitals specializing in certain types of clinical procedures, although they are geographically dispersed. General hospitals are increasingly using sophisticated diagnostics imaging devices, which require highly trained specialized staff. However, such highly trained specialists are often located in the speciality hospitals. This means whenever a second opinion is required the patient and/or diagnostic images needed to be transferred to the speciality hospital. The recent deployment of high speed networks interconnecting all hospitals can, in most cases, transfer diagnostic images electronically. This means physically transporting people and/or diagnostic materials can be eliminated. This project aims to develop an Internet based integrated solution for transferring both high volume cardiac ultrasound (US) images (any images/videos in DICOM format) and messages between hospitals in a fast, secure manner. The system focuses on utilizing existing infrastructure like patient archive communication system (PACS) and national healthcare network.

Methods: A cardiac US scanner (Vivid 7, GE Vingmed Ultrasound AS, Horten, Norway), which produces digitally encoded images and image sequences, was used to acquire US images. The images were compatible with the digital image communication in medicine (DICOM) format. A visualization software, EchoPAC, (GE Vingmed Ultrasound AS, Horten, Norway) was used to push US images to patient archive communication system (PACS) (Sectra AB, Linking, Sweden) using DICOM classes. A web application was developed to create message that is sent together with US images to the recipient hospital. The message, which is used to inform the recipient on incoming cases, contains patient name & ID, study UID, examination, problem, request, sender contact information, and recipient contact information. The web application used query-retrieve to choose correct examination and relevant images from PACS. The application sends a C-MOVE to PACS so that PACS moves the images to another PACS. The message part was encapsulated in an ascii format and was sent using AMTrix (Communicate AS, Oslo, Norway). AMTrix is a message handling system, which supports a wide variety of message formats, databases, and communication standards. The patient sensitive information as well as US images were transferred in a secure, encrypted channel. The web application triggered transmission of the message once it received an acknowledgement from PACS that C-MOVE was successful.

Results & Conclusion: The prototype system has been tested. The department of cardiology at Rikshospitalet and the department of internal medicine at Slandet sykehus in Arendal, Norway are performing clinical use of the system. Cardiac US image sequences were compressed using lossy JPEG standard. This reduced the file size by a factor of 3. Initial test indicates that an examination containing image sequences of 184 MB data required 8.3 minutes to transfer from Arendal to Oslo using PACS to PACS communication on an effective 3 Mbits/s channel. The next version will have functionalities to facilitate effective messaging using internal hospital communication system.

Acknowledgement

11: Present Situation of PACS in the world

Kiyonari Inamura

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PACS of which capability and function have been enhanced, is now penetrating into whole medical information system. Patient consumerism and social paradigm shift have influenced PACS very much. PACS in the environment of multi-centered image diagnosis and external image database employing ASP(application service provider) are examples.

Another example of change in PACS is that multi-directional flow of knowledge with patient's images namely, ubiquitous PACS changed from unidirectional flow of knowledge such as teleradiology.

Progress of technologies in PACS components such as flat panel display, wireless networking, handheld terminal, natural language processing, 5-dimmensional image presentation, as well as standardization applications such as IHE(integrating healthcare enterprise), HL7(high level 7), DICOM(digital imaging and communication in medicine), and HIPAA(health insurance portability and accountability act) are also described.

International standardization activities such as those of ISO (International Standard Organization) and AAPM Task Group are presented. We also specifically discuss HER (electronic health record), radiological diagnosis reporting, DICOM SR (Structured Reporting) and CAD (Computer Aided Diagnosis or Computer Detected Diagnosis).

Innovative hardware technology involving flat panel detector (not imaging plate for computed radiography), flat panel display and their impact to medical imaging informatics will be mentioned.

I would like to conclude that leading edge technology in the field of medical imaging is migrating to rather software oriented one which have fading boundary between existed modalities and methodologies. Standardization activity is also scope of important medical imaging which contributes to diffusion of results of advanced research and development.